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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Fagrenius et al.	:	Group Art Unit:	2841	
Serial No:	10/512,012	:	Examiner:	Hung V. Ngo
Filed:	November 12, 2004	:	Confirmation No:	1958
For:	<b>METHOD FOR ATTACHING A SHIELD CAN TO A PCB AND A SHIELD CAN THEREFOR</b>			

Mail Stop AF  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

**DECLARATION OF FREDRIK PALMQVIST PURSUANT TO  
RULE 37 C.F.R. 1.131**

Dear Sir:

As the person signing below:

1. I, Fredrik Palmqvist, do hereby declare that I am a co-inventor, along with Gustav Fagrenius, in the above-identified U.S. Patent Application No. 10/512,012 ("the '012 application").
2. I have read and am familiar with U.S. Patent No. 6,796,485 to Seidler ("the '485 patent"), which was filed on January 13, 2003, and claims priority to Provisional Application No. 60/351,661 filed on January 24, 2002.
3. I hereby declare that on a date prior to January 24, 2002, Gustav Fagrenius and I conceived the invention of the '012 application. At the time of the invention, Gustav Fagrenius and I owed a duty of assignment of the invention to Sony Ericsson Mobile Communications AB ("Sony Ericsson"). As evidence of our conception of the invention, attached as Exhibit A is a date redacted copy of

Sony Ericsson Invention Disclosure No. 2/0360-LXE 108 057 Uen, signed by two technically competent witnesses. Gustav Fagrenius and I submitted the Invention Disclosure to the appropriate Sony Ericsson patent review committee for purposes of obtaining approval to file a patent application for the invention. I declare that the relevant portions of Exhibit A predate January 24, 2002.

4. On April 30, 2002, a patent application directed to the subject matter claimed in the '012 application was filed in the European Patent Office as European Patent Application 02388032.1 ("the EP Application"). The '012 application claims priority to the EP Application.

5. During the time between January 24, 2002 and the April 30, 2002 filing date of the EP Application, to which the '012 application claims priority, Gustav Fagrenius and I worked through and with the attorneys at Zacco Denmark A/S to finalize and file the EP application.

6. From Exhibit A, it can be seen that the invention in the application was possessed by Gustav Fagrenius and me prior to January 24, 2002. In particular, Exhibit A shows providing a metal can or shield with an extra amount of solder by partly dipping the can into a bath of hot liquid solder. Exhibit A also shows providing a shield with pockets on the shield can and providing an extra amount of solder to the pockets in the shield can. The pockets are triangular (or V-shaped) pockets. When the shield can and printed circuit board ("PCB") are passed through a soldering oven, the solder melts and flows out of the pockets and forms legs on the shield can. The pockets can be formed by, for example, stamping and etching, and solder, such as a solder paste, may be placed in the pockets by, for example, screen-printing or dispensing.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with knowledge that willful

false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and such wilful false statements may jeopardize the validity of the application or any patent issued therefrom.

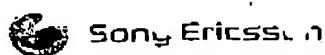
Signed:



Fredrik Palmqvist

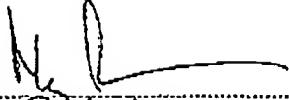
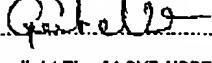
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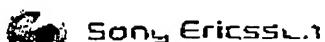
2007-03-23

Exhibit A  
Page 1 of 5

1 (5)

Uppgjord (eller spåsvarande om annan) - Prepared (also subject responsible if other) LD/SEM/GUA/DB Gustav Fagrenius	Nr.-Nr. 2/0360-LXE 108 057 Uen
Dokanmärkning - Doc. marking/Anmärkning <i>Gustav Fagrenius</i>	Kontroll - Checked Datum - Date Rev File A P01-012

Copy:  
LD/SEM/GUA/DBC Fredrik PalmqvistDistribution:  
LD/SEM/RF Martina ÖstergrenInvention Disclosure: *Tolerance Eliminating Shield Can*Read and Understood by:   
Date: \_\_\_\_\_Read and Understood by:   
Date: \_\_\_\_\_



**Exhibit A**  
**Page 2 of 5**

2 (5)

Uppgjord (Även tekniskt svarande om annan) - Prepared (also subject responsible if other) LD/SEM/GUA/DB Gustav Fagrenius	Nr - No. 2/0360-LXE 108 057 Uen
Dokansvarig/Ansvarig - Doc responsible/Approved <i>Gustav Fagrenius</i>	Kontroll - Checked Datum - Date Rev A File P01-012

**1 NAME OF INVENTION**  
Tolerance eliminating shield can

**2 INVENTOR(S)**  
LD/SEM/GUA/DB Gustav Fagrenius  
LD/SEM/GUA/DBC Fredrik Palmqvist

**3 BACKGROUND**

In order to shield electronic components, in for example mobile phones, some kind of electrically conductive box is normally placed on the PCB. The highest level of shielding is probably reached by soldering metal cans to the PCB. A critical demand that has to be fulfilled to achieve good shielding is that the solder joint has to be well controlled without any unsoldered areas.

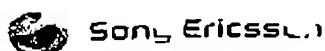
The first step in the soldering process is to screen-print the PCB with solder paste. The thickness of the solder paste is determined by the thickness of the screen-printing stencil and is the same all over the PCB. In the next step the components are put on the board by a pick and place machine. Shield cans are normally placed on the board after the other components since it is on top of them. In the last step of the process the PCB is taken through a soldering oven.

Since small components, like resistors and capacitors, need small volumes of solder paste and large components, such as shield cans, need large volumes of solder paste, the thickness of the screen-printing stencil has to be a compromise of these two different needs.

Neither the metal cans nor the PCBs can be manufactured perfectly flat, the flatness is also likely to be affected by the heat in the soldering oven. This means that there will always be a gap between the shield can and the PCB. This is no problem as long as the gap is filled with solder. The thickness of the solder paste is as mentioned above limited and this means that the size of an acceptable gap also is limited. Since the width of the gap is getting larger when the size of the shield can increases the thickness of the solder paste layer limits the size of the shield can.



Read and Understood by: *[Signature]* Date: \_\_\_\_\_  
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**Exhibit A**  
**Page 3 of 5**

3 (5)

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LD/SEM/GUA/DB Gustav Fagrenius		2/0360-LXE 108 057 Uen	
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<i>Gustaf Fagrenius</i>		A	2011-01-12

**4****STATE-OF-THE-ART**

In the Ericsson factory in Kumla extra solder paste sometimes have been dispensed to the PCB in the areas where shield cans are to be placed.

Soldered shield cans have been avoided in several projects due to the soldering problem described above.

**5****PROBLEM**

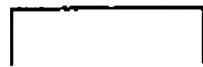
The dispensing process is expensive and frequently becomes a bottleneck in the production.

In the projects there soldered shield cans are used the size of them has to be limited.

The electrical components are constantly getting smaller in order to save board space. Smaller components must have less solder paste to get soldered properly. According to soldering experts from Flextronics (some of them former Ericsson employees) this will lead to that thinner screen-printing stencils will be used in the future. This means that the need of extra solder for the shield cans will increase.

**6****SOLUTION**

As mentioned above, the gaps are not a problem if they are filled with solder. Extra solder can be built in to the shield cans. The metal cans are produced the same way as today but before they are placed in tape on reel they are partly dipped into a bath of hot liquid solder. Some solder will stick to the metal can and when the can is removed from the bath the solder will congeal. The volume of solder added to the metal can may be controlled by controlling how deep into the solder bath the can is dipped and by the temperature and composition of the bath.



Metal can.

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**Exhibit A**  
**Page 4 of 5**

4 (5)

Uppsjord (pvori hakiareenv om annan) • Prescribed (also subject responsible if other)	Nr - No.
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	Datum - Date   Rev   File A   P01-012

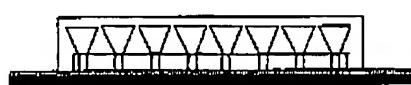


Metal can with extra solder paste.

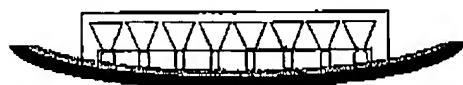
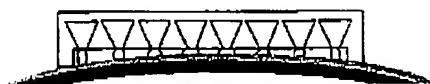
Another way to eliminate the tolerances is using solder as legs for the shield can. This can be done by adding solder in pockets on the shield can. When the shield can and the PCB are brought through the soldering oven the solder melt and flow out of the pockets which are shaped so that the solder automatically forms legs on the shield can. It may seem like this would give insufficient shielding due to the gaps between the legs. This is not the case since these gaps differ from the problem gaps described above. The size of the gaps between the soldering legs are well-defined and will not decrease the shielding effectiveness as long as they are kept small enough.



Shield can with triangular pockets filled with solder.



Shield can and PCB after passing through the soldering oven.



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 Read and Understood by: .....  
*H. L. G. L.*

Date: .....  
 Date: .....



**Exhibit A**  
**Page 5 of 5**

5 (5)

Uppgjord (ovan teknisk/eng eng om annan) - Prepared (also subject responsible if others)	Nr. No.		
LD/SEM/GUA/DB Gustav Fagrenius	2/0360-LXE 108 057 Uen		
Dokanskt Godk - Doc respons/Approved <i>Gustav Fagrenius</i>	Korr - Checked	Datum - Date	Rev

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201-012

Shield cans are normally manufactured in a continuous process where the metal, which the cans are made of is formed as a very long sheet rolled up on a coil. The metal sheet is continuously rolled off the coil and fed into the manufacturing process. By adding a few stations before the manufacturing stations used today the solder filled pockets could easily be created. It is also possible to put the new stations on a separate line and coil the metal sheet up on a new coil after having created the solder filled pockets. The new stations needed are: Number one, a station where the pockets are formed by for example stamping or etching. Number two a station where solder paste is put in the pockets by for example screen-printing or dispensing. Number three a heat applying station where the solder is melted. All these stations can be made very simple since none of the operations have to be complex. For example no screen stencil is needed in the screen-printing station because of the way the pockets are formed.

**7****MERITS OF INVENTION**

Dispensing of extra solder paste will no longer be needed.

Soldering problems are avoided.

Larger shield cans can be used.

It will be possible to use shield cans also in the future even if the thickness of the solder paste screen printed to the PCB will decrease.

**8****ENCLOSURES**

<Known relevant Prior-Art documents and descriptions of the invention>

*Not mandatory to fill in*

**9****CLAIMS PROPOSAL**

<A listing of the novel features of the invention>

*Not mandatory to fill in*

Read and Understood by: *M. L* Date: \_\_\_\_\_  
 Read and Understood by: *Gustav* Date: \_\_\_\_\_